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SPERRY INSTRUMENTS

Analog Multimeter

Owners Manual

- Read this owners manual thoroughly before use and save

HSP5

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1. Introduction

The GMT-312 is an Analog Multimeter capable of measuring 5 functions on 12 ranges. Small lightweight and rugged construction. This meter was designed for the homeowner, hobbyist and professional needing to make electrical and electronic equipment measurements.

1.1 Meter Functions

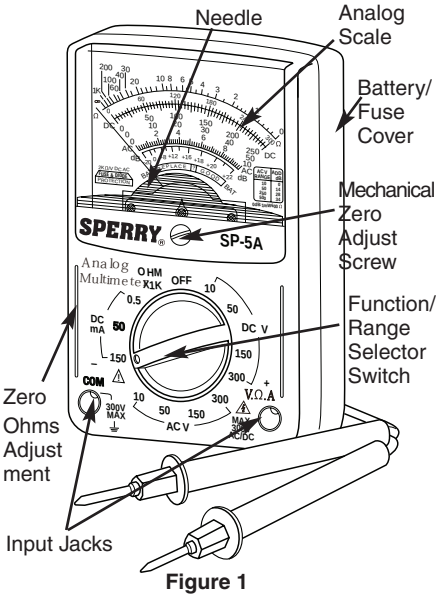

Figure 1

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2. Specifications

Ranges:	12 measuring ranges
DC Voltage:	10-50-150-300 Volts
AC Voltage:	10-50-150-300 Volts
DC Current (Milliamperes):	0.5-50-150mA
Resistance (Ohms):	Rx1K (resistance indicated multiplied by 1000) 1 Megohm max
Decibels:	-20dB to +56dB on AC voltage ranges
Accuracy:	DC voltage, mA = ±4% full scale of range AC voltage = ±5% full scale of range Resistance = ±4° arc of scale length
Sensitivity:	2000 ohms per volt DC and AC
Function/Range Switch:	5 functions 13 positions 12 measuring ranges
Zero Ohms Adjustment Dial:	Located on the left side of the housing; adjustment dial is used to zero the needle indicator on the ohms scale while shorting the test leads together.
Mechanical Zero Adjustment Screw:	Located directly below the center of the meter scale; adjust needle indicator to read zero at the left side of the scale before taking any measurement.
Recessed Input Jacks:	Negative (-) input jack for black test lead, positive (+) input jack for red test lead.
Fuse Type:	F200mA H, 250V, GB GF-0306
Power Source:	One 1.5V AA size (non-rechargeable) battery
Test Lead Type:	ETL, cETL, CATII 300V 1A ⧈
Size (L X W X H):	approx 93mm X 62mm X 32mm
Weight:	approx 117g (including battery)
Agency Approvals:	ETL cETL, CATII 300V ⧈
Operating Temperature:	64F-77F (18°C-25°C)
Note:	Accuracy is given for one year, at 23°C ± 2° RH<60%

This multimeter was designed to be safe at least under the following conditions
Indoor Use

Altitude:	up to 2000m
Pollution degree:	2
Ingress Protection Degree:	IP20

Important:

Read this operators manual thoroughly before using this multimeter. This manual is intended to provide basic information regarding this multimeter and to describe common test procedures which can be made with this unit. **Many types of appliance, machinery and other electrical circuit measurements are not addressed in this manual and should be handled by experienced service technicians.**

⚠WARNING Use extreme caution when using this multimeter. Improper use of this meter can result in severe damage to property, severe personal injury or death. Follow all instructions and suggestions in this operators manual as well as normal electrical safety precautions. Do not use this multimeter if you are unfamiliar with electrical circuits and proper test procedures.

2.1 For Your Safety

The marking "⚠" on the multimeter represents Caution, risk of electric shock.

The marking "⚠" on the multimeter represents Caution, risk of danger, important information, refer to the manual. In order to find out the nature of the potential HAZARD and any actions which have to be taken consult the manual in all cases where "⚠" is marked.

The marking "⏚" on the multimeter represents Functional earth terminal.

The marking "⧈" on the multimeter represents Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION.

Measurement category II is for measurements performed on circuits directly connected to the low voltage installation. Examples are measurements on household appliances, portable tools and similar equipment.

1)Use extreme caution when checking electrical circuits.

2) **⚠WARNING** Do not stand in wet or damp work areas when working with electricity. Wear rubber-soled boots or shoes.

3) **⚠WARNING** Do not apply more voltage

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or current than the set range of the multimeter will allow.

4) **⚠WARNING** Do not touch the metal probes of the test leads when making a measurement.
5) Replace worn test leads. Do not use test leads with broken or tattered insulation. Only test leads meeting ETL, cETL, CAT II 300V IA⧈ can be used in this multimeter.
6) Discharge a capacitor before measuring it.
7) Remove the test leads from the circuit being measured as soon as the test is completed.
8) **⚠WARNING** Do not measure voltage when the function/range switch is set on the resistance (ohms) or the current (mA) settings. Never measure current when the meter is set on the resistance range. Never measure AC voltage when the meter is set on DC voltage or DCmA. Setting the meter on the incorrect function may burn out some of the internal circuitry and may pose a safety hazard.

3. Operating Suggestions

1) Set the function/range switch to the proper position before making a measurement. When the voltage or current is not known, it MUST be determined that the capacity of the selected range will handle the amount of voltage or current in the circuit (see #3 under *For Your Safety*). Always start with the highest range in the function. If the reading falls within the range of a lower setting, reset the function/range switch to the appropriate setting for greater accuracy.
2) Avoid placing the meter in areas where vibration, dust or dirt are present. Do not store the meter in excessively hot, humid or damp places. This meter is a sensitive measuring device and should be treated with the same regard as other electrical and electronic devices.
3) Using the meter in areas with high magnetic fields can result in inaccurate readings. For greatest accuracy, lay the meter flat on a non-metallic surface.
4) When the meter is not in use, keep the function/range switch in the OFF position. This keeps the needle indicator from deflecting or ”bouncing” excessively.
5) When disconnecting the test leads from the unit, always grasp the leads where the input jacks meet the meter housing. Never pull the leads out of the jacks by the insulated wire or transport the meter using the test leads as a carrying strap.
6) Never immerse the meter in water or solvents. To clean the housing use a damp cloth with a minimal amount of mild soap.
7) If the resistance (ohms) function of the meter is not going to be used for a week or more, remove the internal battery to avoid potential leaks that may damage the unit.

3.1 Preliminary Adjustments

Fully seat the test leads in the correct input jacks. If necessary, using a small flat tip screwdriver, slowly turn the mechanical zero

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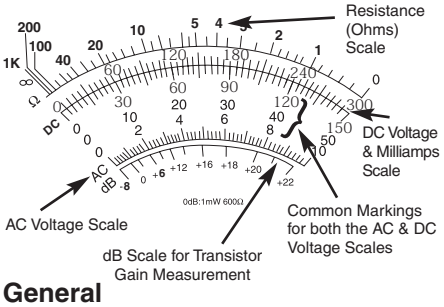
adjustment screw clockwise or counterclockwise until the needle indicator is directly over the three black zeros at the left end of the scale.

Analog Meter: Reading the Scale


Resistance (Ohms) Scale
DC Voltage & Milliamps Scale
AC Voltage Scale
Common Markings for both the AC & DC Voltage Scales
dB Scale for Transistor Gain Measurement

General

The first step in reading the analog scale is to align the needle with the scale.

Resistance (Ohms - Ω)

Use the top scale for reading the resistance. If the meter is set to X1k, multiply the resistance value by 1000Ω.

DC Voltage (V DC)

Use the middle scale. Match the dial setting to the highest number on the scale.

AC Voltage (V AC)

Use the same numbers and procedures as used for the DC voltage setting, but use the scale directly below the numbers.

DC Milliamps

Use the same scale and procedure as used for the DC voltage setting.

Decibel Gain (dB) - see pg. 15

Use the scale marked dB to read decibels for transistor gain. Use the chart at the right of the scale for proper conversion.

3.2 Internal Battery Condition

Before making resistance or continuity tests, check the condition of the internal battery. First turn the function/range switch to the ohms Rx1K position. Short the test leads together and the needle indicator should deflect to the right side of the scale. Keep the test leads shorted together while simultaneously turning the zero ohms adjustment dial until the needle indicator reads zero at the right side of the ohms (green) scale. If the needle will not zero, replace the battery with a new 1.5 volt AA size non-rechargeable battery (see *Battery Replacement*).

4. DC Voltage Measurement

1) Fully seat the test leads in the correct input jacks, (-) black lead, (+) red lead.
2) Set the function/range switch to the appropriate DC voltage range. If the voltage is unknown, use the highest range. If the voltage applied falls within the range of a lower setting, reset the function/range switch to the appropriate setting for greater accuracy.
3) If the polarity of the circuit to be tested is known, touch the black test lead to the neutral side. If the polarity is unknown, touch the test leads to opposite sides of the circuit. If the needle indicator deflects to the left of the scale, reverse the test leads.

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Use the chart below as a guide to reading DC voltage measurements:

DC V range setting	Read following scale
10	0-10
50	0-50
150	0-150
300	0-300

4.1 Household Batteries

Set the function/range switch to 10V DC to test household 1.5 volt through 9 volt batteries. Touch the red (+) test lead to the (+) terminal and the black (-) test lead to the (-) terminal of the battery. Read the 0-10 scale to determine the condition of the battery.

5. DC Milliamp Measurement

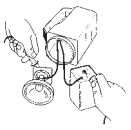
1) Fully seat the test leads in the correct input jacks, (-) black lead, (+) red lead.
2) Set the function/range switch to the appropriate DCmA setting.
3) Touch the test leads to the circuit in series (in line with the circuit) so that the circuit current passes through the multimeter in order to make the measurement. If the needle indicator deflects to the left, reverse the test leads.

DC mA range setting	Read following scale	and multiply reading by:
0.5	0-50	0.01
50	0-50	1
150	0-150	1

Common DC Milliamperage Measurements

It is important to point out that milliamps can also be expressed as thousandths of an Ampere; therefore 150 milliamps is 150 thousandths of one Amp. The 150mA function of your multimeter is commonly used by electronics repair technicians and hobbyists to troubleshoot various low voltage circuits. Although not normally used for electrical troubleshooting around the home, this function can be used to measure the milliamperage draw of household items such as flashlights, and other battery operated devices that do not draw more than 150 mA. In fig. 2 the red (+) test lead is hooked up to the (+) terminal of the lantern battery while the black (-) test lead is hooked up to the bulb. The meter will indicate the milliamperage draw when the flashlight switch is thrown in the ON position.

Figure 2



⚠ WARNING Do not apply voltage to the test leads while the meter is set in the milliamp range. See #8 *For Your Safety.*

6. AC Voltage Measurement

1) Fully seat the test leads in the correct input jacks (-) black lead, (+) red lead.
2) Set the function/range switch to the

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appropriate AC voltage range. If the voltage is unknown, use the highest range. If the voltage applied falls within the range of a lower setting, reset the function/range switch to the appropriate setting for greater accuracy.

3) Touch the test leads to the circuit under test. With AC voltage, the polarity of the test leads is not a factor.

Use the chart below as a guide to reading AC voltage measurements:

AC V range setting	Read following scale
10	0-10
50	0-50
150	0-150
300	0-300

Common AC Voltage Measurements

6.1 Wall Receptacles

If the receptacle is controlled by a switch, make sure the switch is ON. Set the function/range switch to 150V AC. Touch the test leads to the "hot" and "neutral" slots of the receptacle (see fig. 3A). The needle indicator should read 120V AC on the 0-150 scale. To test for proper grounding of the receptacle, touch one test lead to the "hot" (narrow) side of the receptacle, and the other test lead to the ground slot. The meter should read 120V AC as before.

Figure 3

7. Resistance/Continuity Measurement

For resistance and continuity testing **POWER MUST BE OFF**:

1) Fully seat the test leads in the input jacks (-) black lead, (+) red lead.

2) Set the function/range switch to the Rx1K position (resistance indicated multiplied by 1000) and short the test leads together. Using the zero ohms adjustment dial, slowly turn the dial until the needle indicator reads -0- ohms at the right end of the ohms scale. If the needle will not zero, replace the internal battery with a new 1.5 volt AA size non-rechargeable battery (see *Battery Replacement*).

3) Touch the test leads to the resistance or non-energized circuit to be measured. Measure the value of the reading on the green ohms scale and multiply the reading by 1000. If you're making basic continuity tests, the needle indicator should move all the way to the right side of the ohms scale if continuity exists.

Note: When switching the unit back and forth from ohms to other functions, always zero the needle indicator before taking another reading. Failure to zero the needle before taking resistance/continuity measurements will result in inaccurate readings.

Continuity tests are probably the most frequently performed electrical troubleshooting procedures

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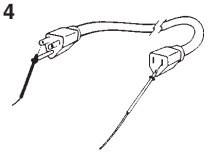
around the home. **ALWAYS REMEMBER THAT CONTINUITY CHECKS ARE TO BE MADE WITH THE POWER TO THE CIRCUIT TURNED OFF**. Polarity of the test leads is not a factor in making continuity checks.

7.1 Extension Cords

Unplug the cord. Set the function/range switch to the Rx1K position. Touch one of the test leads to one of the metal prong ends of the cord, and insert the other test lead in either one of the receptacle slots on the other end of the cord, making sure the test lead is making good contact with the receptacle (see fig. 4). If the needle indicator does not move to -0- ohms, insert the test lead into the other receptacle slot, again making sure of good contact. If the needle indicator still does not move the cord has a break and should be replaced.

Figure 4

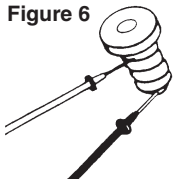


7.2 Fuses

Note: With the power OFF, always remove a fuse from its socket before testing it. With cartridge fuses, touch the test leads to each end of the fuse (see fig. 5). If the fuse is good, the needle indicator will move to -0- ohms. If not, replace the fuse. On plug-type fuses, touch the the test leads on the bottom contact and the other on the threaded metal contact (see fig. 6).

Figure 5

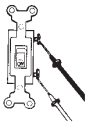
Figure 6



7.3 Switches

Cut off the power source to the switch. If necessary, remove the switch. Turn the switch to the ON position and touch the test leads to the switch terminals (see fig. 7). If the switch is good, the needle indicator will move to -0- ohms. If not, replace the switch. On other switches such as three-way light switches or double pole double throw (ON-OFF-ON) switches, each ON position will need to be tested. Alternate the test leads between the switch terminals to determine which two terminals control that ON position.

Figure 7



8. Decibel Measurement

The decibel feature of this multimeter is for transistor gain measurement in electronic circuits and should not be confused with audio decibels. This function is used primarily by electronics technicians to measure the power gain in transistors, and is rarely encountered in home project applications.

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1) Fully seat the test leads in the correct input jacks, (-) black lead, (+) red lead.
2) Set the function/range switch to any one of the AC voltage ranges and read the decibel measurement on the bottom (red) scale of the faceplate. Based on the AC voltage range you selected, you will need to compute the actual measurement by using the decibel conversion chart located at the bottom right of the faceplate.

Important: For absolute decibel measurements, circuit impedance must be at least 600 ohms. -0- decibels = 1 milliwatt in a 600 ohm impedance (equivalent to 0.775 volts across 600 ohms).

9. Battery and Fuse Replacement

1) Remove the screw in the back cover of the meter and carefully separate the back cover from the front.
2) Note the polarity of the battery when removing it from its compartment and replace.
3) Use F200mA 250V replacement fuses, GB model GF-0306
4) Carefully replace the back cover and tighten the screw. Do not overtighten, as this may strip the threads in the meter housing.

10. Warranty

1 YEAR WARRANTY limited solely to repair or replacement; no warranty of merchantability or fitness for a particular purpose. Product is warrantied to be free of defects in materials and workmanship for the normal life of the product. In no event shall Gardner Bender be liable for incidental or consequential damage.

11. Correct Disposal of this product

This marking indicates that this product should not be disposed with other household wastes throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.